



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

**PATENT**  
2557SI-001239/US

APPELLANTS: Jung-hyun LEE, et al.

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GROUP: 2811

FILED: March 11, 2004

EXAMINER: Ori Nadav

FOR: METHOD FOR MANUFACTURING OXIDE FILM HAVING HIGH DIELECTRIC  
CONSTANT, CAPACITOR HAVING DIELECTRIC FILM FORMED USING THE  
METHOD, AND METHOD FOR MANUFACTURING THE SAME

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July 7, 2011

**REASONS FOR PRE-APPEAL REQUEST FOR REVIEW**

Dear Sir:

In response to the Final Office Action (hereinafter 'Action') mailed April 7, 2011, and the Advisory Action mailed June 14, 2011, Appellants request that the Pre-Appeal Brief Review Board (hereinafter 'Board') review the pending rejections, concurrently with the filing of a Notice of Appeal.

I. **MATERIAL UNDER REVIEW**

Claims 22-23 are pending in the current application. Claims 1-21 and 24-37 were cancelled in the Amendment filed April 17, 2007. Claim 22 is the sole independent claim.

Review is requested for the rejection of: (i) claim 22 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,982,230 to Cabral Jr., et al. (hereinafter "Cabral Jr.") in view of U.S. Patent Publication No. 2002/0014647 to Seidl et al. (hereinafter "Seidl") and U.S. Patent No. 3,996,021 to Chang et al. (hereinafter "Chang") and (ii) claim 23 under 35 U.S.C. § 103(a) as being unpatentable over Cabral Jr., Chang, Seidl, and further in view of U.S. Patent No. 6,486,080 to Chooi et al. (hereinafter "Chooi").

A. CLAIMS 22 AND 23

Claims 22 and 23 are directed to a capacitor of a semiconductor device. Claims 22 and 23 are provided below for the Panel's convenience.

22. A capacitor of a semiconductor device, the capacitor comprising:  
a lower electrode formed on a semiconductor substrate;  
an AHO  $((\text{Al}_x, \text{Hf}_{1-x})\text{O}_y)$  film formed on the lower electrode;  
an upper electrode formed on the AHO  $((\text{Al}_x, \text{Hf}_{1-x})\text{O}_y)$  film; and  
a dielectric film having a dielectric constant that is higher than that of the AHO  $((\text{Al}_x, \text{Hf}_{1-x})\text{O}_y)$  film between the upper electrode and the AHO  $((\text{Al}_x, \text{Hf}_{1-x})\text{O}_y)$  film,  
wherein the dielectric film is an  $\text{HfO}_2$  layer, a  $\text{ZrO}_2$  layer, or an STO layer, and  
wherein the dielectric film is directly in contact with the upper electrode.

23. The capacitor of claim 22, further comprising:  
an oxidation barrier film formed between the lower electrode and the AHO  $((\text{Al}_x, \text{Hf}_{1-x})\text{O}_y)$  film.

B. REJECTIONS UNDER 35 U.S.C. § 103(a)

i. CLAIM 22

Claim 22 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,982,230 to Cabral Jr., et al. in view of U.S. Patent Publication No. 2002/0014647 to Seidl et al. and U.S. Patent No. 3,996,021 to Chang et al. Appellants respectfully traverse this rejection for the reasons detailed below.

On pages 2-3 of the Office Action, the Examiner states that Cabral teaches (in Figure 29 and related text) a capacitor of a semiconductor device, the capacitor comprising a lower electrode 33 formed on a semiconductor substrate 30; a first dielectric film 34 formed on the lower electrode; an upper electrode 35 formed on the first dielectric film; and a second dielectric film 34 between the upper electrode and the film, wherein the second dielectric film is an  $\text{HfO}_2$  layer, a  $\text{ZrO}_2$ , or an STO layer, and wherein the second dielectric film is directly in contact with the upper electrode.

However, the Examiner admits that Cabral does not teach using an AHO  $((\text{Al}_x, \text{Hf}_{1-x})\text{O}_y)$  film as the first dielectric film. According to the Examiner, Chang allegedly teaches the advantages of using an AHO film, and Seidl teaches in figure 1n and related text a capacitor comprising a lower electrode 60, an AHO  $((\text{Al}_x, \text{Hf}_{1-x})\text{O}_y)$  film

70 formed directly on the lower electrode, and an upper electrode 80 formed on the AHO film. Therefore, it allegedly would have been obvious to a person of ordinary skill in the art at the time the invention was made to replace the first dielectric film in Cabral's device with an AHO( $(\text{Al}_x\text{Hf}_{1-x})\text{O}_y$ ) film in order to improve the device characteristics. Appellants respectfully disagree.

Chang discloses that an article having an aluminum and hafnium oxide coating has a longer life of 2 times or more than when a surface is coated with solely an  $\text{Al}_2\text{O}_3$  film (see column 2, lines 62-63 and column 6, lines 41-44). However, Appellants submit that an  $\text{Al}_2\text{O}_3$  film of Chang is a material for coating a surface of an article, instead of a dielectric layer (see col. 2, lines 44-64). The advantage taught in Chang for using a coated film that is made of Al and HfO is to improve resistance of a metallic article for oxidation and sulfidation. As such, Chang does not disclose a capacitor and/or a material for a dielectric of a capacitor. Accordingly, Appellants submit that one of ordinary skill in the art would not have been motivated to modify Cabral's capacitor to include the AHO layer of Chang, because Chang's AHO film would be used to coat a metal article in Cabral, which is not suggested because the technical field of Cabral is not related to coating a metal article (see Example 10 of Chang, which states, the coating prepared in this example would protect the **nickel-base superalloy** longer than a coating without Hf).

Accordingly, the disclosure of Chang would not have provided motivation to one of skill in the art to replace the first dielectric film 34 of Cabral with the AHO layer of Chang, because Chang does not teach any advantages to an AHO layer being used as a dielectric film in a capacitor. See MPEP § 2143.01 ("The mere fact that references can be combined or modified does not render the resultant combination obvious unless the results would have been predictable to one of ordinary skill in the art". *KSR International Co. v. Teleflex Inc.*, 550 U.S. 398, 82 USPQ2d 1385 (2007)).

Appellants submit that Seidl also fails to cure any of the aforementioned deficiencies of Cabral and Chang.

Furthermore, regarding the motivation for combining Cabral, Seidl and Chang, the Examiner must provide a "reasoned explanation as to why the invention as claimed would have been obvious to one of ordinary skill in the art at the time of the invention." Examination Guidelines Update: Developments in the Obviousness Inquiry After *KSR v. Teleflex*, Notice, 75 Fed. Reg. 53643, 53645 (Sept. 1, 2010).

Therefore, Appellants submit that the Examiner does not provide a clear rationale including articulated reasoning that one of ordinary skill in the art would have been motivated to combine the teachings of Cabral, Seidl and Chang in order to render obvious a capacitor of a semiconductor device as recited in claim 22.

Instead, the Examiner makes the conclusory statement that it would have been obvious to a person of ordinary skill in the art at the time the invention was made to replace the first dielectric film in Cabral's device with an  $\text{AHO}((\text{Al}_x\text{Hf}_{1-x})\text{O}_y)$  film as disclosed in Chang in order to improve the device characteristics. However, Appellants submit that one skilled in the art would not have been motivated to replace the first dielectric film in Cabral's device with an  $\text{AHO}((\text{Al}_x\text{Hf}_{1-x})\text{O}_y)$  film as disclosed in Chang for the reasons stated above, and would only have made the Examiner's proposed combination by relying on the teachings of the present specification, i.e., improper hindsight reconstruction, rather than a reason with some rational underpinning for modifying Cabral with Chang or Seidl.

Without a clear rationale for making the proposed combination, the Examiner could render obvious every modification or combination, and a requirement for some technical or logical motivation absent guidance provided by the present specification for making the combination would be effectively removed. See MPEP § 2143.01; citing *Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993) and *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006).

For all of the above reasons, Lee, Chang and Seidl, whether alone or in combination, fail to render obvious the limitations of claim 22.

The Appellants, therefore, respectfully request that the rejection to Claim 22 under 35 U.S.C. § 103(a) be withdrawn.

## ii. CLAIM 23

Claim 23 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Cabral Jr., et al., Chang et al., Seidl et al., and further in view of U.S. Patent No. 6,486,080 to Chooi et al. Appellants respectfully traverse this rejection for the reasons detailed below.

Even assuming *arguendo* that Chooi could be combined with Cabral, Chang and Seidl (which Appellants do not admit), the Examiner has failed to show how Chooi

remedies the deficiencies of Cabral, Chang and Seidl with respect to independent claim 22.

In fact, Chooi discloses that a hafnium oxide film or a zirconium oxide film, and **not** an AHO film is formed on a silicon nitride oxidation barrier (see col. 2, lines 16-20 of Chooi).

Thus, claim 23, dependent on claim 22, is patentable over Cabral, Chang, Seidl and Chooi for the reasons set forth above with respect to independent claim 22 as well as for its own merits.

The Appellants, therefore, respectfully request that the rejection to Claim 23 under 35 U.S.C. § 103(a) be withdrawn.

II. CONCLUSION

In view of the above remarks, Appellants respectfully request that the Board recommend reconsideration and withdrawal of all grounds of rejection and allowance of the pending claims.

Should there be any outstanding matters that need to be resolved in the present application, the Board is respectfully requested to contact the undersigned at the telephone number below.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 08-0750 for any additional fees required under 37 C.F.R. §§1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,  
HARNES DICEY & PIERCE, PLC

By \_\_\_\_\_

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